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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/US89/04887 (22) International Filing Date: 7 November 1989 (07.11.89) (30) Priority data: 267,877 7 November 1988 (07.11.88) US (71) Applicant: BRANDT MANUFACTURING SYSTEMS, INC. [US/US]; P.O. Box 66, Deposit, NY 13754 (US). (72) Inventors: BRANDT, Thomas, L. ; RD 3, Box 3470, Windsor, NY 13865 (US). WILLKENS, Daniel, N. ; 414 Guinnip Ave., Elimira, NY 14905 (US). (74) Agent: CUSHING, David, J.; Sughrue, Mion, Zinn, Macpeak & Seas, 2100 Pennsylvania Avenue, Washington, DC 20037-3202 (US).		(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent). Published <i>With international search report.</i>
(54) Title: GLASS CONTAINER TRANSPARENT COATING SYSTEM (57) Abstract A topcoating for glass containers that will be abrasion resistant, presents a high gloss finish, affords increased impact resistance. A method for in-line high speed application to glass containers and curing of the topcoating is disclosed. The topcoating will retain its adhesion to the glass container throughout the various food and beverage packaging operations as well as handling in the marketplace and by the consumer.		

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GLASS CONTAINER TRANSPARENT COATING SYSTEM

REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of application no. 07/267,877 filed November 7, 1988, and is related to concurrently filed applications having attorney docket numbers A-5477-1, A-5636 and A-5637, the disclosures of said applications being incorporated by reference herein.

BACKGROUND OF THE INVENTION

The present invention is directed to a technique for protecting glass containers, and more particularly to a technique for applying a coating to protect a label and impart high impact and abrasion resistance to the glass container.

There is an ongoing program in the container industry to reduce the weight of the container by reducing wall thickness. Specifically, this is being accomplished by more uniformly distributing the glass throughout the container, i.e., moving glass from the heavy wall areas to the inherently thinner wall areas, while at the same time reducing the amount of glass used, thereby reducing the weight. How thin the glass may be and still meet internal pressure and external impact requirements is influenced largely by th

strength of the glass and the geometry of the container.

The benefits of reduced weight are economic: lower glass melting fuel and material costs, higher container manufacturing speeds (lower cost) and reduced product shipping costs.

Another factor influencing the strength of any given container is the degree to which the outer surface has been scratched, abraded or flawed, where this surface damage occurs and how subsequent internal pressure or external forces are applied. Because of the countless combinations possible, it is beneficial to protect the outer glass container surface from damage.

To date, protection of the outer surface of the container has been accomplished by surface treatment during the container manufacturing process, using vapor and spray devices to provide lubricity to the contact surfaces before the containers are subjected to the potentially damaging automatic conveying, inspection, washing, filling and labeling operations.

During those conveying operations, the containers are subject to considerable line pressures as well as abrading of one container against another. Surface damage may result and, if severe enough, may result in a weakened bottle.

As glass container production rates increase, the frequency and severity of impact and abrasion increases.

The very thin films provided by the techniques practiced today provide some abrasion protection but little impact protection.

SUMMARY OF THE INVENTION

It is an object of the present invention, with certain variations, to overcome the above-described limitations of prior art glass container surface protection and to foster further glass container weight reductions without increasing risks to the consumer.

More particularly it is an object of this invention to provide a glass container coating which is durable, highly impact resistant and which enhances the appearance of the glass container to which it is applied.

It is a further object of the invention to provide a coating which can be used not only to provide impact and abrasion resistance to the container itself but which can also be used to overlay and protect a label applied to a container, and which improves the labeled container appearance, durability and impact resistance as well.

It is a further object of the invention to provide a technique for producing the coated containers at production line rates, i.e., 500 containers/minute.

5 These and other objects and advantages of the invention are achieved by using heat- or UV-curable acrylic materials as container protection coatings. One such material is a UV-curable acrylic composed of film formers, resins, reactive diluents and additives
10 and butyl acetate solvents. The material is typically sprayed on the bottle, solvent flashed off and the remaining solids cured with ultraviolet light. The resulting coating is at once scratch and abrasion resistant, impact resistant and retains a high gloss
15 throughout its life. Impact resistance of containers with the topcoat has been demonstrated at 30% to 40% greater than like containers with existing surface treatments. Other demonstrations of water immersion for extended time have been successfully concluded
20 with no loss of adhesion or abrasion resistance.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be more clearly understood from the following description in conjunction with the accompanying drawing, which illustrates a bottle

processing system for practicing the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The method described can be scaled for various production rates and be operated in line with container production.

It is common practice in the glass container industry to coat the container outer surface with a tin oxide film prior to annealing and with a second film, e.g., polyethylene, after annealing. According to this invention, the tin oxide film is eliminated and a film of a material such as ammonium stearate is deposited after annealing. The topcoat and ammonium stearate are compatible with one another, to insure optimum adhesion of the topcoat to the glass surface while also providing lubricity adequate for conveying through the glass plant operations prior to application of the topcoat.

If operated in conjunction with a labelling system such as disclosed in copending U.S. patent application identified by attorney docket number A-5477-1 filed concurrently herewith, the bottles are container is heated to a temperature of 200 °F in any one of a number of ways familiar to those of skill in

The gripper devices are attached to a conveyor network whose design allows for spacing of the glass containers to optimize the coating and curing of the coating materials. The grippers should also be
5 designed for rotating the container at the spraying and curing positions to insure uniform coating and processing.

Rather than spraying, the application of the coating solution could be accomplished by belt or
10 roller coating as described in copending application A-5477-1 identified above. Alternative methods of applying the topcoat include, but are not limited to, the use of a roller shaped to conform to the contour of the container, a belt flexible enough to conform to
15 the container contour, or flowing the coating over the container while it is slowly rotated. Dipping may also be advantageous. Each option has its own merits and must be weighed against economics, quality and production rates.

20 The containers are then conveyed to an ultraviolet light cure chamber designed to provide the necessary ultraviolet light exposure to completely cure the topcoat. It has been demonstrated that an energy level of 300 watts/in. for 6 seconds insures a
25 complete cure. This is at a distance of 6" from the U-V System Lamp.

Immediately following cure of the topcoat, the container can be packaged for shipment and subsequent wash, filling and pasteurization, if required, by the various food and beverage packaging operations.

5 The single figure herein illustrates the use of the present invention in conjunction with the labelling system described in copending application A-5477-1. The coating with ammonium stearate would be performed before the bottles are received at the upper
10 right of the figure along a conveyor 100. The bottles would then be transferred to a loading station 104 one at a time by a star wheel control device 102. The bottles are then moved downwardly onto an indexing table 106 by means of a suitable placement device.
15 The indexing table 106 will include container holders, e.g., suction holders or the like, which are arranged in groups of three, with each group of three being arranged rectilinearly. There may be supports at the neck of each container to absorb pressure during the
20 container transfer.

After loading three bottles onto the indexing table 106, the indexing table is then rotated counterclockwise from the loading station to a container orienting station generally designated at
25 reference character 108. If desired or necessary for the particular type of container and label being used,

the container may here be rotated to a particular orientation, although this will be unnecessary in many container labeling systems. The rotating of the container would preferably be performed by rotation of individual container holder suction cups on the indexing table 106 until the correct position is detected, e.g., by suitable photo-electric means, at which point the holders would be locked in their correct positions. (If locked, they will have to be unlocked prior to the label application step, as the label application step requires rotation of the bottles as will be described in more detail below.)

If it is desirable to burn off residual lubricant, this can be done at station 108, in addition to proper orienting of the bottles, preferably by an oxidizing flame but alternatively by other means such as corona treatment. This is generally not necessary in the preferred embodiment herein, since the ammonium stearate appears to be sufficiently evaporated by the residual heat of the bottles.

After proper orienting of the bottles and removal of lubricant, the indexing table 106 is further rotated to bring the bottles to the label transfer station where the labels are applied, and the indexing

table is then rotated to a coating station 114 where the coating of this invention is applied.

5 The indexing table 106 is then further rotated to bring the labeled and coated bottles to an unloading station where each container is off-loaded onto a container conveyor. There are a number of ways in which the bottles could be removed. All bottles could be removed from the indexing table 106 to a single conveyor 120, taking care to ensure that the coatings
10 are not disturbed. It may, be necessary, with suitable care taken, to use an air knife. It may, however, be necessary to move the bottles by clamping them at their "finish" and carrying them onto the conveyor 120 in a known manner.

15 It is also to be remembered that the bottles are held in groups of three on the indexing table 106. In the interest of speed, it would be possible to arrange three separate conveyors 120 each for receiving one of the three bottles in each group from the indexing
20 table 106.

Once on the conveyor 120, the coating on the bottles is cured in a suitable manner, e.g., by heat or U-V energy. For speed, it would be desirable to position U-V lamps on either side of each container.
25 If desirable, it would also be possible to rotate each container by 90° during the curing process to provid

full coverage of the container by the opposing lamps. After the curing process, the conveyor 120 carries the bottles to a further container inspection area (if desired) and thence to a packing or filling station.

5 A topcoating material as described herein will increase abrasion and impact resistance of the glass container, will be waterproof and unaffected by the contents of any food or beverage, will be glossy and will not be abraded by like material, and will cover
10 flaws and irregularities on the surface of glass containers such as to render them nearly invisible. It will also bond to a protective label.

 It will be appreciated that further modifications could be made to the embodiment disclosed above while
15 still obtaining many of these advantages and without departing from the spirit and scope of the invention as described in the appended claims.

WHAT IS CLAIMED IS:

1. A glass container coating material comprising a heat-curable acrylic.

2. A glass container coating material comprising an ultraviolet-curable acrylic.

3. A glass container coating material according to claim 1, including agents for blocking transmission of ultraviolet light.

4. A glass container coating material according to claim 3, wherein said coating material is substantially colorless

5. A glass container coating material according to claim 1, having a higher abrasion resistance than glass.

6. A glass container coating material according to claim 2, having a higher abrasion resistance than glass.

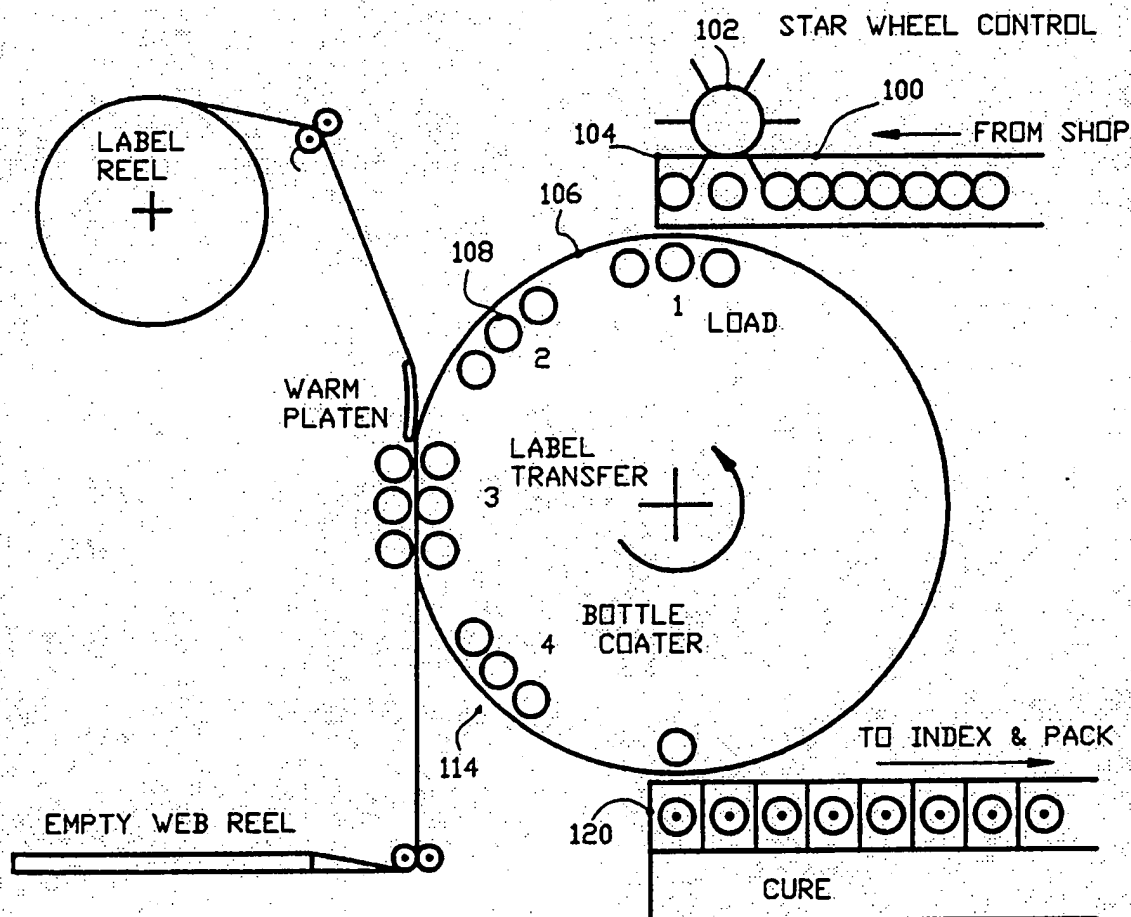
7. A method of coating a glass container, comprising the steps of applying an acrylic coating, and curing said acrylic coating.

8. A method according to claim 7, wherein said curing step comprises heating said container.

9. A method according to claim 7, wherein said curing step comprises irradiating said container with ultraviolet light.

10. A method according to claim 7, further comprising the step of applying a label to said container prior to application of said acrylic coating.




11. A method according to claim 7, wherein said acrylic material substantially covers flaws and irregularities on the surface of said container to significantly decrease the visibility thereof to the human eye.



FIGURE

INTERNATIONAL SEARCH REPORT

International Application No. **PCT/US89/04887**

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) * According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: B 05 D 3/06; B 32 B 17/10 U.S.Cl.: 427/ 54.1, 384																							
II. FIELDS SEARCHED <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black; margin: 5px 0;">Minimum Documentation Searched †</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%; border: 1px solid black; text-align: left;">Classification System</th> <th style="border: 1px solid black; text-align: left;">Classification Symbols</th> </tr> <tr> <td style="border: 1px solid black; vertical-align: top; padding: 5px;">U.S.</td> <td style="border: 1px solid black; vertical-align: top; padding: 5px;">215/12.2, DIG 6; 220/455; 427/54.1, 384, 388.4, 393.5; 428/34.7, 336, 417, 426; 156/272.2, 275.5</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black; margin: 5px 0;">Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched ‡</div>			Classification System	Classification Symbols	U.S.	215/12.2, DIG 6; 220/455; 427/54.1, 384, 388.4, 393.5; 428/34.7, 336, 417, 426; 156/272.2, 275.5																	
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III. DOCUMENTS CONSIDERED TO BE RELEVANT * <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; text-align: left;">Category *</th> <th style="width: 60%; text-align: left;">Citation of Document, †† with indication, where appropriate, of the relevant passages ‡‡</th> <th style="width: 30%; text-align: left;">Relevant to Claim No. ‡‡</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;">US, A, 3,083,854 (LUSHER), 02 APRIL 1963, See Figure 2; col 2, lines 17-42.</td> <td style="vertical-align: top;">1-11</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td style="vertical-align: top;">US, A, 3,859,117 (ERCHAK), 07 JANUARY 1975, See entire document.</td> <td style="vertical-align: top;">1-11</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;">US, A, 3,937,853 (SHANK), 10 FEBRUARY 1976, See col 1, lines 21-44; col 2, lines 8-19.</td> <td style="vertical-align: top;">1-11</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;">US, A, 4,053,076 (VOGEL), 11 OCTOBER 1977, See col 4, lines 8-31.</td> <td style="vertical-align: top;">1-11</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td style="vertical-align: top;">US, A, 4,268,554 (GRAS), 19 MAY 1981 See entire document.</td> <td style="vertical-align: top;">1-11</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A, P</td> <td style="vertical-align: top;">US, A, 4,860,906 (PELLEGRINI), 29 AUGUST 1989 See entire document.</td> <td style="vertical-align: top;">1-11</td> </tr> </tbody> </table>			Category *	Citation of Document, †† with indication, where appropriate, of the relevant passages ‡‡	Relevant to Claim No. ‡‡	Y	US, A, 3,083,854 (LUSHER), 02 APRIL 1963, See Figure 2; col 2, lines 17-42.	1-11	A	US, A, 3,859,117 (ERCHAK), 07 JANUARY 1975, See entire document.	1-11	Y	US, A, 3,937,853 (SHANK), 10 FEBRUARY 1976, See col 1, lines 21-44; col 2, lines 8-19.	1-11	Y	US, A, 4,053,076 (VOGEL), 11 OCTOBER 1977, See col 4, lines 8-31.	1-11	A	US, A, 4,268,554 (GRAS), 19 MAY 1981 See entire document.	1-11	A, P	US, A, 4,860,906 (PELLEGRINI), 29 AUGUST 1989 See entire document.	1-11
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents: †‡</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Δ" document member of the same patent family</p> </div> </div>																							
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border: 1px solid black; vertical-align: top; padding: 5px;"> Date of the Actual Completion of the International Search <div style="text-align: center;">19 JANUARY 1990</div> </td> <td style="width: 50%; border: 1px solid black; vertical-align: top; padding: 5px;"> Date of Mailing of this International Search Report <div style="text-align: center; font-size: 1.2em;">21 FEB 1990</div> </td> </tr> <tr> <td style="border: 1px solid black; vertical-align: top; padding: 5px;"> International Searching Authority <div style="text-align: center;">ISA/US</div> </td> <td style="border: 1px solid black; vertical-align: top; padding: 5px;"> Signature of Authorized Officer <div style="text-align: center;">  Merrell C. Cashion, Jr. Primary Examiner </div> </td> </tr> </table>			Date of the Actual Completion of the International Search <div style="text-align: center;">19 JANUARY 1990</div>	Date of Mailing of this International Search Report <div style="text-align: center; font-size: 1.2em;">21 FEB 1990</div>	International Searching Authority <div style="text-align: center;">ISA/US</div>	Signature of Authorized Officer <div style="text-align: center;">  Merrell C. Cashion, Jr. Primary Examiner </div>																	
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